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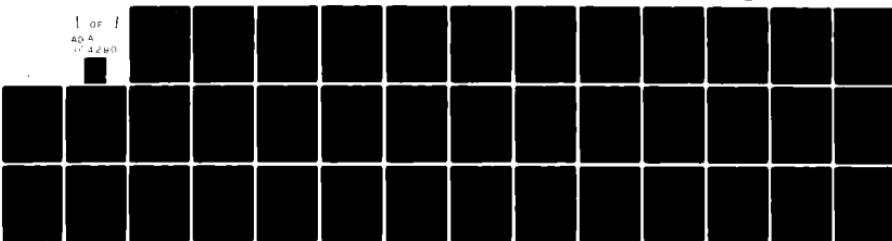
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DEPOT PERFORMANCE ANALYSIS

March 1981

C. H. Hanks
D. V. Glass

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EXECUTIVE SUMMARY

The Depot Performance Data Base System (DPDBS), developed in prototype and demonstrated in 1979, has been refined and extended. OASD(MRA&L) now has a tool for obtaining management information from the extensive set of historical depot cost and performance data submitted annually by the Military Services. The Service data are being submitted in accordance with the requirements contained in DoD 7220.29-H, "Depot Maintenance and Maintenance Support Cost Accounting and Production Reporting Handbook."

A User Manual for DPDBS was published in February 1981. It contains a number of prewritten queries for extracting from the data base the more common and recurring information of interest to MRA&L maintenance policy officials. It also provides instructions for devising ad hoc queries to extract information of emerging interest.

OASD(MRA&L) can use its improved visibility of the DoD depot maintenance program to enhance its participation in planning, programming, and budgeting (PPBS) activity, a primary responsibility of that office. Before doing so, however, some initiatives must be undertaken with respect to the Program Objective Memoranda (POM) submitted by the Military Departments.

Generally, depot maintenance POMs are not consistent with DoDI 4151.15, "Depot Maintenance Programming Policies." In addition, the POM Preparation Instructions (PPI) are ambiguous. It is suggested that the PPI be revised to (1) prescribe data formats that clearly delineate proposed programs, (2) specify the submission of explicit workload and cost data, and (3) provide precise definition cost data to be included.

The resulting improved POM submittals, coupled with MRA&L's improved visibility of historical data (through the DPDBS), will enable MRA&L to participate more effectively in the review and evaluation of DoD depot maintenance programs.

PREFACE

This report describes the results of the second in a series of tasks undertaken for the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics), OASD(MRA&L). The overall objective is to enhance MRA&L's capability to evaluate depot maintenance programs.

The first task developed a system which provides improved visibility of historical depot maintenance performance, based on cost and production data submitted by the Military Services. The system was demonstrated in prototype, using FY 78 Army cost and production data.

This second task has two goals: first, to refine the prototype system for obtaining historical visibility; and second, to devise a system whereby improved visibility can be used in evaluating proposed depot maintenance programs.

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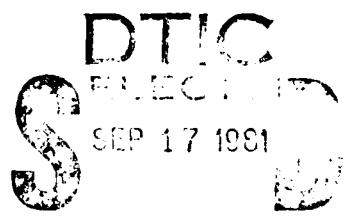


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1. INTRODUCTION

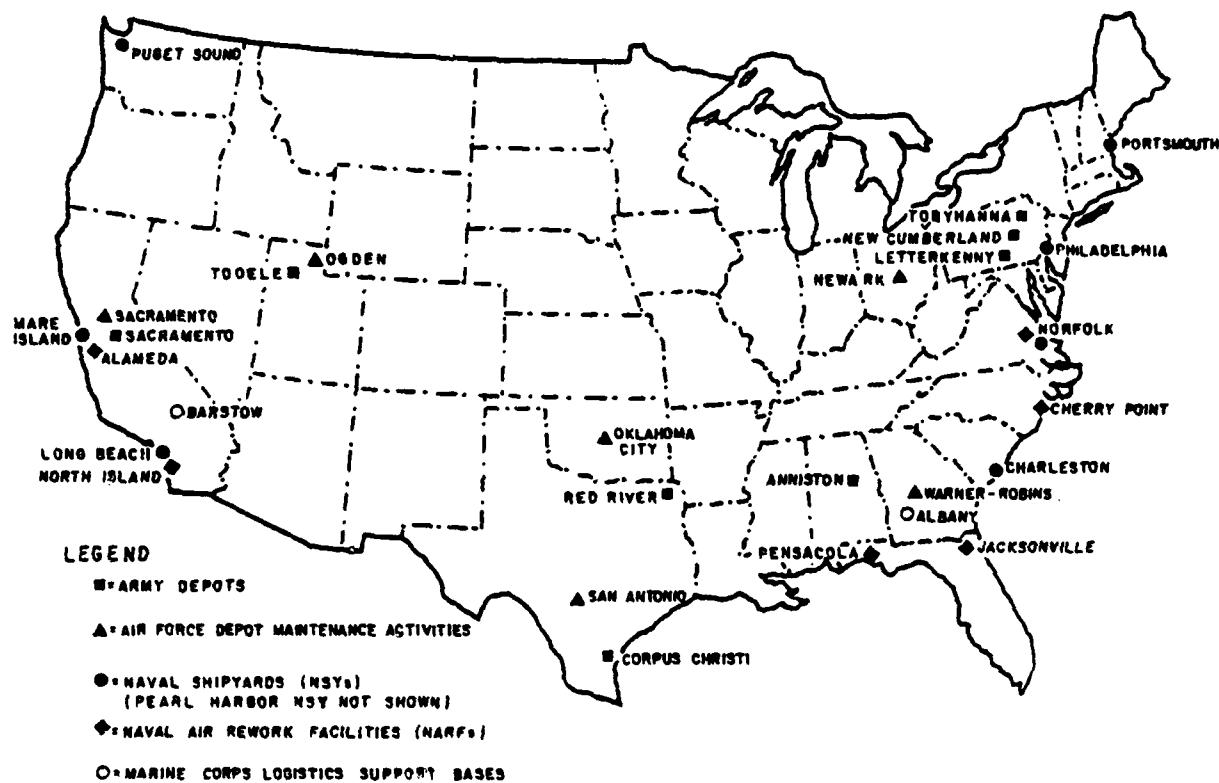
DEPOT MAINTENANCE IN DOD

Depot maintenance is the highest level of maintenance performed within DoD. It includes the overhaul, repair, and modification of military equipment and weapon systems by the use of more extensive shop facilities and equipment and personnel of higher technical skill than are available at lower levels of maintenance (i.e., organizational and intermediate). It is performed primarily at large, fixed-site industrial facilities in the United States and abroad.

Depot maintenance is a large and complex enterprise. Employing over 150,000 people, depot maintenance activities and supporting organizations operate under the control of a variety of logistics, system, and readiness commands. The Military Services (Army, Air Force, Navy, and Marine Corps) operate a total of 30 major organic depot maintenance facilities in the United States (Figure 1-1). In addition, commercial contractors perform substantial depot maintenance--approximately 16 percent of the total cost in FY 79. Depot maintenance equipment and facilities span the spectrum of industrial technology. Work performed ranges from the repair of microscopic electronic components to the complete overhaul of tanks, aircraft, and ships.

Depot maintenance is costly. In FY 79, approximately \$7 billion was spent on depot maintenance. For FY 81, the President's budget, as submitted in January 1980, requests depot maintenance funding in excess of \$9 billion.

FIGURE 1-1. ORGANIC DEPOT MAINTENANCE FACILITIES IN THE U.S.



ROLE OF OASD(MRA&L)

The depot maintenance responsibilities of OASD(MRA&L) are prescribed in DoD Directive 5124.1, "Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics)," which states that the Assistant Secretary shall:

develop policies, conduct analyses, provide advice, make recommendations, and issue guidance on Defense plans and programs

for (approved functions such as)

equipment and support readiness, including repair, over-haul, and modification.

The directive also assigns more specific responsibilities to the Assistant Secretary, including three of particular importance to this study:

- develop systems and standards for the administration and management of approved plans and programs
- review and evaluate programs for carrying out approved policies
- participate in planning, programming, and budgeting (PPBS) activities.

In developing systems and standards, OASD(MRA&L) has issued guidance in two important areas: depot maintenance programming, and uniform depot cost accounting and reporting. For the former, DoD Instruction 4151.15, "Depot Maintenance Programming Policies," specifies the elements to be considered in constructing depot maintenance programs and the data and stratifications to be used in describing them. For the latter, DoD 7220.29-H, "Depot Maintenance and Maintenance Support Cost Accounting and Production Reporting Handbook," specifies uniform cost accounting procedures for all depot maintenance and maintenance support activities and requires annual reporting of historical cost and production data on completed work.

OASD(MRA&L) needs clear statements of proposed depot maintenance programs and their relationship to historical performance, as a minimum, in order to participate effectively in the PPBS process. Such statements, however, are not available. Even though DoDI 4151.15 and DoD 7220.29-H were intended to fill these voids, the appropriate linkage to the PPBS cycle has not been established. The proposed Logistics Resource Annex (LRA) may help, but it will not fully solve the problem; the purpose of the LRA is to provide a unified view of logistics resources, rather than to give a detailed picture of the depot maintenance program per se.

THE PROBLEM

The problem can be stated as a question: How can the Directorate for Maintenance Policy, OASD(MRA&L), enhance its effectiveness in the review and evaluation of depot maintenance programs, particularly during the PPBS cycle?

ORGANIZATION OF REPORT

Since DoDI 4151.15 provides guidance for depot programming and DoD 7220.29-H provides for the availability of data on past performance, these two documents provide the logical starting point for solving the above problem.

Chapter 2 provides an overview of the accounting and reporting guidance specified in DoD 7220.29-H and discusses the degree to which this guidance has been implemented. It also describes the Depot Performance Data Base System (DPDBS) developed for extracting information from 7220.29-H data, and gives examples which demonstrate the system's capability to produce useful information.

Chapter 3 describes the basic concepts of DoDI 4151.15 and Service implementation of those concepts.

Chapter 4 focuses on the depot maintenance data submitted in the Service POMs. The deficiencies of those submissions, particularly as they hinder OASD(MRA&L) review and evaluation, are highlighted.

Chapter 5 discusses the need for revised POM Preparation Instructions in order to increase OASD(MRA&L) effectiveness in reviewing and evaluating depot maintenance programs. Suggested revisions are presented in the Appendix.

2. UNIFORM COST ACCOUNTING

BACKGROUND

In 1976, DoD 7220.29-H, "Depot Maintenance and Maintenance Support Cost Accounting and Production Reporting Handbook," was issued by the Office of the Secretary of Defense (OSD). The primary purpose of the handbook was to institute uniform cost accounting procedures for depot maintenance and maintenance support activities throughout DoD. A secondary purpose was to specify historical cost and production data which the Military Services were to provide OSD at the conclusion of each fiscal year.

Since the handbook was implemented, the Services have submitted historical depot performance data for each of three FYs, 77 through 79. In 1979, LMI developed the DPDBS for accessing and summarizing that historical data. The system's potential to support OASD(MRA&L) information needs was demonstrated using FY 78 Army data.¹

As a part of this current task, the DPDBS was refined and expanded to the other Services. This chapter provides an overview of how the DPDBS provides a capability to transform the extensive set of depot performance data into management information.²

COST AND PRODUCTION REPORTING

The depot cost and production data submitted annually by the Military Services are essentially records of job orders which have been physically and

¹See Depot Maintenance Performance, November 1979 (LMI Task ML914).

²A User's Manual: Depot Performance Data Base System, was published in February 1981 (LMI Task DP102).

financially completed in that year. Each job order record contains 50 data fields providing information in 5 major categories, as follows:

- Record Identification
- Facility Identification
- Item/Service Identification and Customer
- Labor Hour and Cost Data
- Production Data.

The data cover work performed by organic facilities, maintenance support activities, contractors, and other Services through interservice support agreements.

The size of the depot maintenance program, when coupled with the job order format, results in extensive data submissions to OASD(MRA&L). Approximately 100,000 records are submitted each fiscal year. This volume of data presents both disadvantages and advantages to OASD(MRA&L). The disadvantages stem primarily from the physical problems of processing the data. Also, the availability of such detailed data creates the danger of questioning specific Service practices at too fine a level. Nevertheless, while the data present extensive processing problems, they also offer a richness of detail for evaluating future programs. The DPDBS, with its flexibility to summarize the data into meaningful performance indicators, is ideal for capitalizing upon the detail available.

IMPROVED VISIBILITY OF PAST PERFORMANCE

The DPDBS can be used to generate both standard reports and special one-time analyses. In fact, system flexibility is such that virtually any question on past performance, which is posed in terms of the categories covered in the 50 data fields, can be answered. Six examples illustrating this flexibility follow. They have been selected from actual analyses of FYs 78 and 79 data.

Table 2-1 shows the total depot maintenance program, by Service, for FYs 78 and 79. The figures shown include the cost of interservicing, contractor maintenance, and maintenance support, as well as the cost of maintenance performed at organic facilities. They also include the cost of all labor (direct and indirect, civilian and military), material, and overhead as defined in DoD 7220.29-H.

TABLE 2-1. TOTAL DEPOT MAINTENANCE COSTS - FYs 78 AND 79
(\$000)

Service	FY 78	FY 79
Army	1,064,498	1,110,144
Navy	2,919,465	3,036,037
Air Force	2,293,704	2,430,952
Marines	<u>35,171</u>	<u>30,511</u>
TOTAL	6,312,838	6,607,644

The displayed data illustrate the aggregation capability of the DPDBS. The Service totals shown were derived by summing 24 separate cost fields per job order record for over 200,000 records. The table was produced using four lines of code in the DPDBS language. The DPDBS can just as easily extract and report the value of a given cost field on a single job order record for an individual federal stock number item. In between, the DPDBS has full capability to sort and subtotal by type of facility, weapon system, commodity, work breakdown structure (airframe, engine, components, etc.), or work performance category (overhaul, repair, modification, etc.). Multiple stratifications are also possible, such as cost by facility and commodity, or direct labor hours by facility, weapon system, and work breakdown structure.

Table 2-2 shows the Army's FY 79 program by major commodity. Note that both funded (i.e., Operation and Maintenance appropriations) and unfunded (other appropriations) costs are included.

TABLE 2-2. TOTAL ARMY COSTS BY COMMODITY - FY 79
(\$000)

Commodity	Funded	Unfunded	Total
Aircraft	246,882	38,967	285,849
Automotive	52,863	2,018	54,881
Vehicles	261,405	23,472	284,877
Construction	12,080	354	12,434
Comm./Elec.	123,973	12,932	136,905
Missiles	152,647	16,500	169,147
Ships	10,068	89	10,157
Weapons/Muns.	82,524	4,017	86,541
General	49,353	1,343	50,696
Other	<u>17,503</u>	<u>1,147</u>	<u>18,650</u>
TOTAL	1,009,298	100,839	1,110,137

Table 2-3 shows the total Army program by facility type for FYs 78 and 79. Each job order record is categorized according to whether the work was performed organically, by a contractor, or through interservicing. Non-depot maintenance activities may perform some depot maintenance, but they are primarily maintenance support oriented. Maintenance support activities in the Army include, for example, all the materiel readiness commands. The value of the trends shown in Table 2-3 will improve as more historical data accumulate. Trend analysis is an important example of how past performance information can be useful in providing perspective for evaluating proposed programs.

Table 2-4 illustrates the capability of the DPDBS to summarize facility information. Shown are the FY 79 direct labor hours, direct labor and material costs, and overhead costs for six Air Force depot facilities. This type of information can be used as an independent check on the reasonableness of Service cost estimates projected in future programs.

TABLE 2-3. TOTAL ARMY COSTS BY FACILITY TYPE - FYs 78 and 79
(\$000)

Facility Type	FY 78	FY 79
<u>Organic</u>		
Depot Maintenance Activity	624,918	767,835
Non-Depot Maintenance Activity	<u>199,491</u>	<u>207,781</u>
Total	824,409	975,616
<u>Contractor</u>		
Mainz	148,172	37,247
Other	<u>84,736</u>	<u>85,516</u>
Total	232,908	122,763
<u>Interservice</u>		
Marine Corps	0	7,125
Navy	7,719	4,127
Other	<u>213</u>	<u>512</u>
Total	7,932	11,764

TABLE 2-4. AIR FORCE LABOR HOURS & COSTS BY FACILITY - FY 79
(\$000)

Facility	Direct Labor Hours (000)	Cost			
		Direct Labor	Direct Material	Overhead	Total
Newark	1,538	17,819	9,302	17,157	44,278
Ogden	6,819	76,505	123,507	67,568	267,580
Oklahoma City	7,627	84,186	220,355	76,410	380,951
Sacramento	6,228	77,945	76,245	60,129	214,319
San Antonio	7,300	75,077	193,963	60,078	329,118
Warner-Robins	6,575	78,741	110,086	66,790	255,617

Table 2-5 shows the cost of direct maintenance (maintenance support is excluded) for selected Army weapon systems in FYs 78 and 79. It demonstrates the flexibility of the DPDBS to summarize historical performance data by supported weapon system. Such summaries are particularly useful because they

readily display weapon system support from one fiscal year to the next. They can also identify major shifts in the distribution of weapon system workloads.

TABLE 2-5. ARMY DIRECT MAINTENANCE WEAPON SYSTEM COSTS - FYs 78 and 79
(\$000)

Weapon System	FY 78	FY 79
<u>Aircraft</u>		
UH-1H	73,338	81,429
AH-1G	18,904	12,081
CH-47C	27,767	34,655
CH-47A	15,667	12,573
OH-58A	17,113	15,391
<u>Combat Vehicles</u>		
M60A1	52,332	31,169
M60	30,994	26,863
RECOV VEH M578	19,688	21,387
HOW 8IN M110	20,367	20,580
M48A1	29,915	18,884

As a final example, Table 2-6 displays a small portion of the output from a query applied to Air Force FY 79 data. The query requested a listing of all items, by stock number, which received the same type of maintenance at two or more facilities. The numeric entries in the facility column are contractor codes.

TABLE 2-6. AIR FORCE SAME ITEM/SAME WORK - MULTIPLE FACILITIES COST COMPARISONS - FY 79

Item Name	Item Number	Work Performance Category	Facility	Production Quantity	Average Cost (\$)	Total Cost
Turbofan	00TF0030007	Partial Overhaul	Oklahoma City Sacramento	30 2	\$30,748 13,337	922,440 26,674
Hercules	00WC01308	Partial Overhaul	Warner-Robins 013260189010	1 1	347,546 118,147	347,546 118,147
Electric Generator Sets	6115004690710	Overhaul	EZ1205 Sacramento 589381768026	18 54 63	2,462 2,301 2,234	44,316 124,254 140,742

A benefit of refining the DPDBS has been the identification of errors, inconsistencies, and omissions in the data submitted by the Military Services. In many cases these problems exist because Service implementation of DoD 7220.29-H guidance has not been directed toward bringing internal accounting systems into full compliance with 7220.29 standards. Instead, "after-the-fact" systems, for reporting purposes only, have been developed, and inaccuracies have occurred as a result. As these data are used, however, the accuracy and reliability of Service reporting should improve.

Even though some benefits can be anticipated from using the DPDBS to analyze and evaluate past performance, the primary benefits should come through applications which draw upon past performance to improve future programs. Because the DoD 7220.29-H reporting requirements are intended to complement the long-range programming practices prescribed in DoDI 4151.15, the purposes of that Instruction, and how the Services have responded to the guidance it contains, are discussed in the next chapter.

3. DEPOT MAINTENANCE PROGRAMMING POLICY

OVERVIEW

OASD(MRA&L) guidance for depot maintenance programming is given in DoDI 4151.15, "Depot Maintenance Programming Policies." The purpose of the Instruction is to prescribe "concepts, criteria, and policy governing the establishment and use of a mechanized depot maintenance programming system." In broad terms, the Instruction identifies the elements to be considered in the development of depot maintenance programs, and outlines the data and stratifications to be used to describe them. Its salient policy provisions are:

- Depot maintenance programs should be aligned with approved operating forces.
- Programming should be weapon system oriented.
- Programming should facilitate consideration of alternative approaches for depot maintenance.
- Programming should be mechanized to the maximum extent practicable.
- Organic workloads (in direct labor hours) should be identified to the depot maintenance facilities designated to perform the work.

The main thrust of DoDI 4151.15 is that programming should start with the key elements, weapon systems and facilities, and use the measures of workload and cost to build the program. Program reporting should have the same orientation to weapon systems and facilities, and use the same measures to describe the programs.

This approach to depot maintenance programming is necessary if the programs are to be responsive to changing inventories and usage of major systems and if they are to be amenable to analysis and validation with regard to need, capability, cost, and efficiency. Programming completely in line with this

approach would be ideal. However other considerations, such as maintaining workload continuity and acceptable levels in the workforce, create a tendency to program according to what the depots can do as opposed to what is required to be done. The goal of DoDI 4151.15 is to minimize this tendency.

CURRENT IMPLEMENTATION STATUS

With some important exceptions, the Services are programming depot maintenance in accordance with DoDI 4151.15; that is, programs are developed based on projected workload requirements of weapon systems and end items, and workload is distributed in ways which take facility capacity and capability into account.

This is not to say, however, that the Services all use the same depot maintenance programming system; there are significant technical differences in methodology, level of detail, labels and categories of data, and responsiveness. Some examples of these differences are given below.

Different Methodologies

The Army and the Air Force each have designated particular organic facilities for depot maintenance on particular systems. The Army has done this with its "prime depot" approach and the Air Force with its Technology Repair Center program. In contrast, Naval Air Rework Facilities have much more overlap in their capabilities than do the Air Force and Army depots. As a result, the workload distribution methodologies employed by Army and Air Force are not as extensive as that found in Naval Air.

A second area in which methodologies vary is in the procedures used to assemble the depot programs. The algorithms employed in requirements calculations, for example, vary among the Services, even for common components. The algorithm employed to compute projected component workload requirements in the Army's "OPS-25" forms is not the same as that used by the

Air Force in its "D041" system for components (exchangeables). These differences take on particular significance when system outputs are submitted to OASD(MRA&L) as back-up information to the POMs.

Differences in Detail

Both NAVAIR and NAVSEA project workload distributions to greater levels of detail than do the Army or the Air Force. In the Navy's long-range programming systems, workload is explicitly projected to the level of production shops and work centers and costed accordingly. In the Army and Air Force projections to this level of detail are not done until the budgeting and scheduling phases, which take place after long-range programming is completed. Instead, the Army and Air Force employ unit costs and workload standards, applied to requirements, to obtain their long-range projections.

Non-Uniformity in Labels and Categories

As an example of non-uniformity in the Service programming systems, the Army, Navy, and Air Force each use distinct work performance categories (WPCs) as shown in Table 3-1. Of these, only the Army's Work Accomplishment Codes (WACs) are in reasonably close conformance with the WPCs defined in DoDI 4151.15. The Navy's Program/Sub-Program (P/SP) designators are not work performance codes in the strict sense. Instead, the Program relates to systems or work breakdown structures (e.g., aircraft, engines, components, etc.), while the Sub-Program describes the work to be performed.

Differing Degrees of Responsiveness

In projecting requirements, the Army applies non-serviceable asset generation factors based on the preceding 12 quarters of experience. The Air Force D041 system uses the previous eight quarters. The responsiveness of the two systems to changes in force structure or operational conditions in the field is different as a result.

TABLE 3-1. WORK PERFORMANCE CATEGORIES AND CODES

NAVY (NAVAIR only)		NAVY (Cont'd)		AIR FORCE	
P/S/P	Title	P/S/P	Title	Program Unit	Title
0002	Emergency Repair	0503	Mfg. Kits - Other	C00C	Modifications
0019	Midterm Rework	0504	Mfg. For Mods	D00A/MOD	INAN/MOD
0013	SDLM Crash	0505	Mfg. - Miscellaneous	F0016	Storage (Maintained)
0036	Standard Depot Level Maintenance	0601	Trainer Devices Mods	F0022	Eng/Quality Analysis
0037	Standard Depot Level Conversion	0602	Drive - In Mods	F0058	Storage (Removal)
0038	Standard Depot Level Modification	0603	Field Team Mods	F0060	Analyst Cond Insp
0620	Airframe Work in Process (Carry In)	0604	Mod-Concurrent with Components	F0082	Drop-In Maint.
0101	Missile Repair	0605	Mod-Concurrent with Engine Major Repair	F0100	Preparation for Shipment
0102	Missile Repair/Modification	0606	Mod-Concurrent with Engine Repair	F0112	Struct Integrity
0106	Missile Mod - Repair	0607	Change Incorporation Back Log	F0124	Destruct Analysis
0120	Missile Work In Process	0608	Miscellaneous	F0136	Manufacture D/M
0201	Engine Overhaul	0611	Mod-Concurrent with SDLM	F0154	Manufacture SF
0203	Engine Major Repair	0612	Mod-Concurrent with SDLM/Conv.	F0156	Reclamation
C-04	Engine Repair	0613	Mod-Concurrent with SDLM/Major Mod	F0160	Fly-In Maint.
0217	Augmented AIMD Support	0614	Mod-Concurrent with SDLM/SLEP	F0166	Fly-In Maint.
0220	Engine Work In Process (Carry In)	0601	Non Aeronautical	F0180	Emergency Maint.
0305	Components - SPPC 4A Cos Items	0602	Non Aeronautical	F0184	Crash/Battle Damage
0306	Electronics & Communications - ASO	0603	Non Aeronautical	C0088	Major Repair
0307	Electronics & Communications - SDLM	0604	Non Aeronautical	H000A	Repair
0308	Repair of Repairables			K000A	Depot Maint.
0309	Component Pilot Rework			M000A	MOD/Major Repair
0310	Miscellaneous Component Rework			N000A	INAN
0311	Airframe & Engine Accessories - ASO			R000A	Rehabilitation
0312	Airframe & Engine Accessories - SDLM			V000C	MOD Maint.
0313	High Unit Material Component Rework				
0320	Component Work In Process				
0404	Salvage				
Preservation and Depreservation					
0405	Fleet Training	A1	Cyclic/Normal Overhaul		
0406	Acceptance/Transfer	A2	Crash/Battle Damage		
0408	Fleet Calibration - Types I & II	B0	Progressive Maintenance		
0410	Customer Service	C1	Conversion (not in conj) w/overhaul/repair		
0413	Installation of Plant Equipment	C2	Conversion (in conj) w/overhaul/repair		
(4.14)	Special Projects Tasks	D0	Activation		
0415	Reclamation and Disposal	E0	Inactivation		
0417	Shipboard Work Supporting NAVALIR	F0	Renovation		
0418	Interservice - Other Support	G0	Analytical Rework		
0419	Ground Support Equipment	H1	Modification (not in conjunction w/overhaul/repair)		
0421	Foreign Government Support	H2	Modification (in conj) w/overhaul		
0427	Weapon Systems Support Department	I0	Repair		
0429	Force Support - Fleet	J1	Inspec & Test Excluding Calibration		
0476	Demilitarisation	J2	Inspec & Test Calibration		
0478	Force Support - Reserves	J3	Inspec & Test Calibration & Pre-Shop for Reliability Centered Maint at Depot		
(4.32)	Contractor Support	K0	Fab/Manufacture		
0483	Training Devices - Excluding Mods	L0	Reclamation/Dissassembly		
0488	Other Support - Non O & MN	M0	Maintenance Assistance		
0495	Federal Personnel Program	N0	Plant Equipment		
0493	Other A/C Support Items - O & MN	T0	Cancellation/Reduction Costs		
0501	Mfg. Navy Stock Fund Stores	X1			
0502	Mfg. Navy Industrial Fund Inventory				

Program Unit
Code

Program Unit
Title

Responsiveness in terms of turnaround from the time change decisions are made to development of updated programs reflecting those changes also varies among the Services. The NAVAIR long-range planning model, which is one of the faster systems, takes up to six weeks to exercise. It should also be noted that none of the systems provide a continuous update capability; they were designed primarily to be responsive to the annual PPBS process.

The preceding discussion of Service differences in programming depot maintenance is not meant to be critical. The Services cannot be faulted for having different systems. DoDI 4151.15 does not attempt to establish a specific methodology for depot maintenance programming per se, but instead focuses on the elements to be considered in the process.

SUMMARY

Depot maintenance programming is being accomplished by the Military Services generally in accordance with the main thrust of DoDI 4151.15. Nevertheless, there are many differences in the ways the Services do long-range programming. These differences, however, are primarily technical in nature. The effect of the differences is most evident in backup submissions to the depot maintenance POMs. Such backup submissions vary in both content and format, and are frequently too detailed to be useful to OASD(MRA&L) in the short time available for POM review. A possible corrective measure would be to require increased uniformity among the Services in their implementation of the programming aspects of DoDI 4151.15. But this approach would not attack the problem directly. Backup submissions would not be necessary if the POMs, as the prime vehicle for program descriptions, were structured more in accordance with the guidance of DODI 4151.15. Given that Service programming systems contain the necessary information, it is the

presenting of the programs, i.e., the format and structure of the POMs, that is the problem, not the programming systems.

The extent of this problem is discussed in the next chapter.

4. DEFICIENCIES IN DEPOT MAINTENANCE POMS

POM SUBMISSIONS IN DEPOT MAINTENANCE

The POMs are the primary instruments used by the Military Services to communicate their proposed depot maintenance programs to the Secretary of Defense. POMs are prepared annually in accordance with POM Preparation and Format Instructions (PPI), issued by the Office of the Assistant Secretary of Defense (Program Analysis and Evaluation). The general guidance in the PPI for the logistics area is that the POMs shall summarize the programs, including the resources (funds and manpower) to be applied, and the rationale and methodology used to develop the programs. In the PPI for the 1982-86 POMs, the specific instructions for Maintenance, Modernization, and Alteration programs are:

- Provide a summary of the Program VII depot maintenance program in a display similar to Format VI-C-1.
- Formats for ship maintenance will be developed jointly by OASD(MRA&L) and the Navy.
- Provide a summary of both specifically planned and expected modification/alteration programs in a display similar to Format VI-C-2.

Given the size and complexity of depot maintenance within DoD, the brevity of these instructions is noteworthy.

The distinction made between Navy ship maintenance and other depot maintenance arises because the Navy uses a unique program element structure for ship maintenance under Program II, General Purpose Forces. In contrast, Army, Air Force, and NAVAIR depot maintenance are included in Program VII, Central Supply and Maintenance.

The Format VI-C-1 referred to in the PPI is displayed in Figure 4-1. The program categories appear in Figure 4-2. Since the four categories called for

FIGURE 4-1. POM FORMAT VI-C-1

POM Depot Maintenance Program^a
(\$ Million)

FY 51 - - - - - FY 56

A. Category 1^b

1. Backlog Unfunded End Last FY
2. Generations During FY
3. Total Repair Requirement (A.1. + A.2.)
4. POM Funding
5. Unfunded Requirement (A.3. - A.4.)

B. Category 2

(Same as in A.)

C. Category 3

(Same as in A.)

D. Category 4

(Same as in A.)

E. Total All Categories

1. Total Requirements
2. POM Funding
3. Unfunded Requirements

F. Depot Maintenance Industrial Fund Manpower

^aAll dollars will be escalated as directed by the Fiscal Section of this instruction.

^bServices will provide data for categories indicated in attachment (Figure 4-2).

FIGURE 4-2. POM DEPOT MAINTENANCE PROGRAM CATEGORIES

<u>ARMY</u>	<u>NAVY</u>	<u>MARINE CORPS</u>
<u>Aircraft</u>	<u>Aircraft</u>	Weapon System Maintenance Supply System Maintenance
Airframe Overhauls	Airframes	
Engines	Engines	
Repair of Secondary Items	Secondary Items	
Maintenance Support	Modification	
Other	Other Support	
<u>Combat Vehicles</u>	<u>Ships</u>	<u>AIR FORCE</u>
Vehicle Overhauls	Overhauls	Aircraft Maintenance
Repair of Secondary Items	RA/TA	Airframes and Modifications Engines Overhauls
Maintenance Support	TMA	Aviation Exchangeable Components
Other		
<u>Other Depot Maintenance</u>	<u>Ordnance Rework</u>	<u>Other Depot Maintenance</u>
Missile Overhaul	Air-Launched Missiles	Missiles
Repair of Secondary Items	Torpedoes	Other Major Non-Aviation Items
Maintenance Support	Other	Non-Aviation Exchangeable Repair
Other		

in Format VI-C-1 are not clearly defined, the Services supply their own interpretations. To illustrate, the Army does not use Format VI-C-1 nor its attachment. Instead, its program is stratified into Organic-AIF (Army Industrial Fund), Non-AIF, Contract-Commercial, and ISSA (Interservice Support Agreement). The Air Force uses Format VI-C-1 but provides information on six workload categories: aircraft, missiles, engines, other major equipment items, exchangeables, and area/base support. The Navy uses the 11 categories specified in the attachment.

The PPI is also unclear on the specific depot maintenance costs to be included. It implies that the POMs are to reflect total program costs. Yet, the Army separately submits maintenance support costs, while the Air Force and Navy do not. Presumably, the Air Force and Navy allocate their maintenance support costs over the workload categories. Since only total costs are submitted, the extent of contractor support is also obscured. Furthermore, by not calling for separate labor and material costs (the latter are escalated over the POM period while the former are not), the POMs provide little insight into real program growth.

To compound these problems, the format and level of detail called for in the PPI inhibit an effective review of the proposed programs. In particular, the requested information is inconsistent with DoDI 4151.15, which calls for structuring depot programs by weapon system and performing facility. DoDI 4151.15 also requires the program to be expressed in both cost and workload. Without such information, it is difficult for OASD(MRA&L) to determine whether the programs are responsive to changing inventories and usage, and whether depot maintenance resources are efficiently applied. In addition, with no workload data available, it is impossible to assess the validity of cost estimates, or Service productivity levels.

The lack of workload data, combined with the imprecision and extreme aggregation of the cost data, prevents OASD(MRA&L) from using the information available on past performance to full advantage in evaluating future programs. As described in Chapter 2, OASD(MRA&L) now has information available from the cost and performance data reported under DoD 7220.29-H, including labor and material costs, direct labor hours by weapon system and facility, and indirect and overhead charges. The ease with which these data can be accessed and summarized using the DPDBS provides a potentially powerful capability for evaluating proposed depot maintenance programs. However, this capability cannot be fully realized until the POMs are modified to show workloads and costs by facility and weapon system.

The lack of clear program description in the POMs is not solved by the submission of backup data (e.g., OPS-25 forms from the Army). The backup data are Service peculiar and too voluminous for use at the OASD(MRA&L) level, particularly in the limited time available for POM review.

THE LOGISTICS RESOURCE ANNEX

Another potential source of data for depot maintenance programs will be the Logistics Resource Annex (LRA), which should be available within the next one to two years.

The LRA is being developed as a single source of summary information on the logistics resources that DoD programs, in total, will consume. The need for the LRA arose from the difficulty in isolating the logistics requirements in the FYDP program element structure. As currently planned, the LRA will call for logistics information in three formats:

- Format A will display logistics funding (TOA) by functional area, and where applicable, by organizational level.
- Format B will display logistics manpower by functional area.

- Format C will display resources for specific, designated weapon systems by selected programs and work performance areas.

Although the LRA formats contain useful information on depot maintenance, they will not provide a unified description of the depot maintenance program per se. The proposed Formats A and B, for example, divide the total logistics program into various functional categories and subcategories. In some of these categories the depot maintenance resources are clearly identified as such, but in many others they are not. To illustrate, there is no provision for identifying depot maintenance resources in the areas of Logistics Management & Support Activities, Installations & Facilities Support, and Sustaining Engineering & Technical Support. The functional categories and subcategories have been designed to ease the summarizing of logistics resources. Depot maintenance functions intersect many of these categories, but not in a directly identifiable way. Thus, in the same way that the current FYDP structures make it difficult to obtain a comprehensive picture of logistics overall, the proposed LRA formats do not provide a unified picture of the total depot maintenance program.

Even if depot maintenance resources could be clearly identified in the LRA, additional information would still be required to correct the noted deficiencies in the POMs. As currently structured, the LRA will primarily provide only funding and manpower data. It will not contain information on requirements, nor will it show any workload data by weapon system or individual facility. As noted earlier, this kind of information is necessary to evaluate how efficiently depot maintenance resources are being applied.

As a final point, the LRA will not replace the POMs. The POMs will continue to be the primary documents for depot maintenance program review. The ability of OASD(MRA&L) to participate effectively in this review has been restricted by the content and formats of the program data submitted by the

Military Services. For the most part, the POM data are ambiguous, difficult to analyze in terms of past performance, and frequently too highly aggregated to be of value. Even with an LRA, these deficiencies will continue to exist, unless the POMs themselves are improved.

5. NEED TO REVISE PPI

To correct the deficiencies in POM submissions and provide OASD(MRA&L) with clear program descriptions amenable to analysis, the PPI for depot maintenance programs should be revised. As a minimum, the revised PPI should:

- prescribe data formats that clearly delineate proposed programs
- specify the submission of explicit workload and cost data, by weapon system and facility
- provide precise cost definitions.

This action is feasible from both OASD(MRA&L) and Service perspectives. The PPI mechanism is designed to accommodate these kinds of changes and OASD(MRA&L) has the responsibility to initiate them. The Services will be able to use their existing depot maintenance programming systems to comply with the revised requirements. Data requirements will not be excessive and, considering current POMs and backup submissions as a whole, may even be reduced from current levels. By establishing clearly defined bounds on the data to be submitted, OASD(MRA&L) will be in a better position to use the limited time available for POM review. This action would also increase the usefulness of the proposed LRA. For example, the weapon systems designated in Format C of the LRA could also be the set of systems for which information is requested in the revised PPI. In this way, the requirements, workload, and facility data in the revised POMs would be complemented by the manpower and work performance data in the LRA. Finally, this action would bring program descriptions in the POMs into compliance with the long-range programming policy prescribed in DoDI 4151.15.

In concert with the PPI modifications, analytic tools to evaluate proposed programs in the light of past performance should be developed. Techniques such as cost and workload estimating relationships and historical trend analyses are needed. The established DoD 7220.29-H/DPDBS system should be used to obtain the necessary past performance indicators, including:

- costs per direct labor hour
- direct labor hours per overhaul for specific systems
- capacity utilizations by facility.

With initial development proceeding simultaneously with the PPI modifications, these analytic tools should be designed to be directly applicable to the revised submissions, again recognizing the limited time available for POM review.

A preliminary formulation of specific PPI revisions, presented in the Appendix, is offered for review and comment. The suggested revisions were designed to allow direct application of historical performance information (from the DoD 7220.29-H system) to the analysis of proposed programs, while still maintaining compatibility with the LRA.

Revision of the PPI and development of the accompanying analytic tools would significantly enhance OASD(MRA&L)'s capability to review and evaluate depot maintenance programs, particularly during POM review, the point in the PPBS cycle where that office can be most influential.

APPENDIX
DRAFT PPI FOR DEPOT MAINTENANCE PROGRAMS

INTRODUCTION

This Appendix contains a candidate set of instructions and formats to replace the current depot maintenance sections in the PPI. It is intended to serve as a basis for review and discussion only and not as a final product. For example, the different categories of maintenance support called for in Format 1:B.2 may not be of sufficient importance to justify the effort required to obtain the data at that level of detail. The fact that POM submissions allow material costs to be escalated, but not labor costs, may diminish the usefulness of the commodity stratification called for in Format 1:C. The MILCON appropriation in Format 1:D.4 may be available elsewhere in the POM, or the LRA, and therefore not required here. The information requested in Format 2:3 (other customers) may also require modification if too difficult to obtain. The weapon systems called for in Format 3 are those currently planned for inclusion in the LRA. But complete agreement of weapon systems between the LRA and depot maintenance POM submissions is not necessarily a requirement, because the two documents have different objectives. It is in the spirit of the preceding considerations that the proposed PPI should be examined.

PROPOSED PPI FOR DEPOT MAINTENANCE

Each Military Department will provide data in Formats 1, 2, and 3 to describe their depot maintenance programs. Format 1 provides for total program summaries. Formats 2 and 3 provide for program descriptions by facility and selected weapon system. Dollar entries will be TOA unless otherwise

noted. For FY 81 entries, use actual obligations to date plus anticipated obligations for the remainder of the year. For FY 82, use TOA in the President's January budget submission to Congress.

As total program resource levels are desired, data entries should reflect the sum of both industrially funded and non-industrially funded workloads and costs, where applicable. The contribution of all applicable appropriations, both O&M and others, should be included. All depot-level work performance categories, including modification, alteration, and conversion programs, should be included.

For definitions of terms and relevant programming guidance, refer to DoDI 4151.15, "Depot Maintenance Programming Policies." For explicit descriptions of costs to be considered, refer to DoD 7220.29-H, "Depot Maintenance and Maintenance Support Cost Accounting and Production Reporting Handbook." Specific weapon systems designated for Format 3 are, with a small number of exceptions, the same as those requested in the Logistics Resource Annex, which will provide complementary depot maintenance information to that requested in Formats 1, 2, and 3.

FORMAT 1: DEPOT MAINTENANCE PROGRAM SUMMARY

\$ (millions), Hrs. (thousands)

	<u>Fiscal Year</u>						
	81	82	83	84	85	86	87

A. REQUIREMENTS & FUNDING

1. Backlog carried forward from previous fiscal year	-\$-
2. Generations during fiscal year	-\$-
3. Total requirement	-\$-
4. Funding	-\$-

B. MAINTENANCE & MAINTENANCE SUPPORT

1. Depot Maintenance	-\$-/ -Hrs. -
a. Organic	-\$-/ -Hrs. -
b. Interservice	-\$-
c. Contract	-\$-
2. Maintenance Support	-\$-
a. Programming & Planning Support	-\$-
b. Maintenance Tech. & Engineering Support	-\$-
c. Technical & Engineering Data	-\$-
d. Technical & Administrative Data	-\$-

C. COMMODITY GROUPS

1. Aircraft	-\$-
2. Automotive Equipment	-\$-
3. Combat Vehicles	-\$-
4. Construction Equipment	-\$-
5. Electronics & Communications Systems	-\$-
6. Missiles	-\$-
7. Ships	-\$-
8. Ordnance Weapons and Munitions	-\$-
9. General Purpose Equipment	-\$-
10. Others	-\$-

D. APPROPRIATION

1. Operations and Maintenance	-\$-
2. Military Personnel	-\$-
3. Procurement	-\$-
4. MILCON	-\$-
5. Other	-\$-

Line Definitions:

A. TOA shown should include total costs to be incurred by the Service for work performed for that Service, costs of work for other customers should be excluded. Costs considered should include all direct and indirect labor and material costs, overhead and G&A costs, government furnished material costs, contract costs, and maintenance support costs. (See DoD 7220.29-H for definitions of depot maintenance costs.)

1. Backlog discounted and escalated to current year dollars.
2. Total unserviceable generations eligible for depot maintenance.
3. Sum of 1 & 2.
4. Projected 81 funding, 82 budget, 83-87 POM funding.

B. 1. Hrs. are direct labor hours (production and other) of civilian and military personnel for reporting service.
\$ are direct and indirect costs (labor, material, overhead, G&A) of direct maintenance for reporting service, excluding costs of maintenance support functions.

2. Break out a, b, c, d if possible.
\$ are TOA for maintenance support functions (i.e., Work Performance Categories P, Q, R, and S as defined in DoD 7220.29-H).

C. \$ are TOA for work to be performed for reporting Service including maintenance support and regardless of performing activity.

D. \$ are TOA. Appropriations (excluding MILCON) should sum to line A.4.

FORMAT 2: DEPOT MAINTENANCE FACILITY SUMMARY*

\$ (millions), Hrs. (thousands)

	<u>Fiscal Year</u>						
	81	82	83	84	85	86	87

Facility 1

1. Direct Labor Hours	-Hrs.-
a. Direct labor cost	-\$-
b. Direct material cost	-\$-
2. Total Cost	-\$-
3. Other Customers	
a. Direct labor hours	-Hrs.-
b. Total cost	-\$-
4. Physical Capacity	-Hrs.-
5. Industrial Fund Depot Maintenance Civilian End Strength	
6. Depot Maintenance MILCON	-\$-

Facility 2

1.-6.
⋮

Facility N

* Facilities specified in attachment to Format 2.

Line Definitions:

(1.-2.) work to be performed for and paid for by Service that owns facility

1. Direct labor hours, production and other, as defined in DoD 7220.29-H
 - a. Cost of direct labor hours
 - b. Direct material \$s, all appropriations.
2. Total costs for facility includes a, b, and G+A and overhead allocated to 1.
3. Work performed for other customers; interservice support, FMS, etc.
 - a. Direct labor hours as in 1
 - b. Total costs as in 2.
4. Capacity in direct labor hours as defined in DoD 4151.15H, "Depot Maintenance Production Shop Capacity Measurement Handbook."

ATTACHMENT TO FORMAT 2

List of Depot Maintenance Activities

DEPARTMENT OF THE ARMY

Army Depots

Anniston Army Depot, Anniston, Alabama
Sacramento Army Depot, Sacramento, California
Letterkenny Army Depot, Chambersburg, Pennsylvania
New Cumberland Army Depot, New Cumberland, Pennsylvania
Tobyhanna Army Depot, Tobyhanna, Pennsylvania
Corpus Christi Army Depot, Corpus Christi, Texas
Red River Army Depot, Texarkana, Texas
Tooele Army Depot, Tooele, Utah
Mainz Army Depot, Mainz, West Germany

DEPARTMENT OF THE NAVY

Naval Air Rework Facilities

Naval Air Rework Facility, Alameda, California
Naval Air Rework Facility, North Island, San Diego, California
Naval Air Rework Facility, Norfolk, Virginia
Naval Air Rework Facility, Jacksonville, Florida
Naval Air Rework Facility, Pensacola, Florida
Naval Air Rework Facility, Cherry Point, North Carolina

Naval Shipyards

Portsmouth Naval Shipyard, Portsmouth, New Hampshire
Philadelphia Naval Shipyard, Philadelphia, Pennsylvania
Norfolk Naval Shipyard, Portsmouth, Virginia
Charleston Naval Shipyard, Charleston, South Carolina
Long Beach Naval Shipyard, Long Beach, California
Mare Island Naval Shipyard, Vallejo, California
Puget Sound Naval Shipyard, Bremerton, Washington
Pearl Harbor Naval Shipyard, Pearl Harbor, Hawaii

Naval Ship Repair Facilities

Ship Repair Facility, Guam, Mariana Islands
Ship Repair Facility, Yokosuka, Japan
Ship Repair Facility, Subic Bay, Luzon, Philippines

Marine Corps Logistics Support Bases

Marine Corps Logistics Support Base, Atlantic, Albany, Georgia
Marine Corps Logistics Support Base, Pacific, Barstow, California

DEPARTMENT OF THE AIR FORCE

Air Force Depot Maintenance Activities

Oklahoma City Air Logistics Center, Directorate of Maintenance,
Oklahoma City, Oklahoma

Ogden Air Logistics Center, Directorate of Maintenance, Ogden, Utah

San Antonio Air Logistics Center, Directorate of Maintenance,
San Antonio, Texas

Sacramento Air Logistics Center, Directorate of Maintenance,
Sacramento, California

Warner-Robins Air Logistics Center, Directorate of Maintenance,
Warner-Robins, Georgia

Aerospace Guidance and Metrology Center, Directorate of Maintenance,
Newark, Ohio

FORMAT 3: DEPOT MAINTENANCE WEAPON SYSTEM SUMMARY*

\$ (thousands)

<u>Fiscal Year</u>						
	81	82	83	84	85	86

Weapon System 1 (T/M/S; M/D/S; Ship Type/Class; Nomenclature)

1. Inventory	-Units-
2. Operating Tempo	-(see below)-
3. Total Requirement	
a. Total Cost	-\$-
b. Direct Labor Hours	-000-
4. POM Funding	
a. Total Cost	-\$-
b. Direct Labor Hours	-000-
⋮	

Weapon System N

1. - 4.

* Specific weapon systems named in attachment to Format 3.

Line Definitions:

1. Beginning of year Service inventory
2. Average operational tempo per system, measured in appropriate units, e.g., flying hours, mileage, steaming hours, rounds fired, hours of operation, etc. (Use same units as those used to compute requirement in 3.)
3. Include all costs: direct and indirect labor and material, overhead, support, contract, etc.
4. Total cost should be TOA level to be applied against total requirements cost in 3.

ATTACHMENT TO FORMAT 3
(for DM PPI)

<u>Ser-</u> <u>vice</u>	<u>Aircraft</u>	<u>Ships</u>	<u>Missile Systems</u>	<u>Weapons and Combat Vehicles</u>
<u>Army</u>	AH-1G AH-64 (AAH) OH-58A UH-1H UH-60A CH-47		I-HAWK PATRIOT	M-60-A1/A3 Tank M-60-A2 Tank XM-1 Tank M-113-A1 APC M-903 ITV M-110 8" SP How M-109-A1 155mm SP How XM-2 IFV XM-3 CFV
<u>Navy</u>	A-6E A-7E F-4 F-14A F/A-18 E-2B/C EA-6B SH-3 SH-2F(LAMPS) RH-53D S-3A P-3B/C	SSBN(POISEIDON) (3)* SSBN (TRIDENT) CV CVN SSN CG CGN DD DDG FF FFG	POSEIDON TRIDENT (4)* (2)* (9)* (4)* (5)* (4)* (4)* (3)* (2)*	
<u>Marine Corps</u>	AV-8A A-4M A-6E UH-1N CH-46 CH-53			M-60-A1 Tank LVT-7 Landing Vehicle LVT-7-A1 Landing Vehicle
<u>Air Force</u>	B-52 FB-111 KC-135 F-106 A-7 A-10 F-4 F-111 F-15 F-16 EF-111A RF-4 E-3A KC-10A C-130 C-141 C-5		MINUTEMAN II MINUTEMAN III M-X ALCM	

* Number of Ship Classes

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20. ABSTRACT (Cont'd)

the historical cost and production data reported under DoD 7220.29-H, "Depot Maintenance and Maintenance Support Cost Accounting and Production Reporting Handbook." They would be used to project historical performance over the POM period to independently evaluate proposed programs. A data processing system to support this evaluation has already been developed. A Users Manual: Depot Performance Data Base System, was published in February 1981 (LMI Task DP102).

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